Roll No.

B.E/B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, Nov / Dec 2024
MATERIAL SCIENCE AND ENGINEERING
Fourth Semester
ML 5403 MECHANICAL BEHAVIOUR OF MATERIALS
(Regulation 2019)

Time : 3 Hours   Answer ALL Questions   Max. Marks 100
PART-A (10 x 2 = 20 Marks)

1. Draw a stress strain curve of steel and mark the salient points.

2. Distinguish the Burger vector with respect to screw and edge locations.

3. What is the role of equi cohesive temperature in grain boundary strengthening?

4. Define Bauschinger effect.

5. Differentiate between cup and cone fracture

6. Define fracture toughness.

7. Define Endurance limit.

8. List the factors which contribute fatigue failure.

9. Define activation energy.

10. Distinguish between creep and rupture.

Part – B (5 x 16 = 80 marks)

11. (i). What is resolved shear stress and derive an expression for the same.   (6)

    ii). Classify the crystal defects and explain them in detail.   (10)

12. a   (i) Explain in the strain hardening mechanism in detail.   (10)

    (ii) What is rule of mixture and explain how it decides the strength of the composites.   (6)

OR

    b)   (i) What is solid solution strengthening?. Explain the mechanism of solute and dislocation interaction in detail.   (10)

    (ii) Write a brief note on yield point phenomenon.   (6)

13. a)   (i) Expalin the Griffth's theory of crack propagation and obtain an Griffth's

expression for plane strain condition. (10)

(ii) Discuss Orowan's modification on Griffith equation for brittle fracture in metals. (6)

OR

b) (i) Describe the mechanism of crack propagation for both ductile and brittle modes of fracture. (8)

(ii). What is DBTT? Explain the various parameters affecting it. (8)

14. a) (i) Explain in detail the different stages of fatigue failure process. Explain the micro crack initiation mechanism in fatigue. (10)

(ii) Explain the Differences between high cycle fatigue and low cycle fatigue. (6)

OR

b) (i) What is Endurance limit and discuss the factors affecting it. (10)

(ii) A steel plate is subjected to a maximum fatigue stress of 200 MPa, the fracture toughness of the steel is 130MPaVm and the geometry factor a is 1.1 The values of Paris equation parameters are A=6.9X10-12 and p=3.0.How many fatigue cycles are required to fracture the plate? (6)

15. a) (i) Define the term creep? What are the various stages of creep and discuss the factors affecting creep? (10)

(ii) Explain the deformation mechanism map. . (6).

OR

b) Write short notes on any two of the following: (2x8=16)
    (i)   Dispersion and fibre strengthening
    (ii)   Fatigue testing machines
    (iii)   Super plasticity.